

CLAIMS

What is claimed is:

1. An apparatus for analyzing at least one  
5 individual gas component in a multi-component gas  
mixture, comprising:
- (a) an array of at least two chemo/electro-  
active materials connected in parallel  
circuitry, each chemo/electro-active  
10 material exhibiting a different electrical  
response characteristic upon exposure to  
the individual gas component than each  
other chemo/electro-active material;
  - (b) means for determining an electrical  
15 response of each chemo/electro-active  
material upon exposure of the array to the  
gas mixture;
  - (c) means for determining a value for the  
temperature of the array connected in  
20 parallel circuitry with the chemo/electro-  
active materials; and
  - (d) means for digitizing the electrical  
25 responses and the temperature value, and  
calculating a value from the digitized  
electrical responses and temperature  
value, to perform an analysis of the  
individual gas component.
2. An apparatus according to Claim 1 wherein the  
array is situated within the gas mixture, which has a  
30 temperature of about 400°C or more.
3. An apparatus according to Claim 1 wherein the  
gas mixture is an emission from a combustion process.
4. An apparatus according to Claim 1 wherein the  
component gases in the gas mixture are not separated.
- 35 5. An apparatus according to Claim 1 wherein the  
temperature of each chemo/electro-active material is  
determined substantially only by the variable  
temperature of the gas mixture.

6. An apparatus according to Claim 1 wherein the analysis is performed from the electrical responses of the chemo/electro-active materials upon exposure to the multi-component gas mixture only.

5 7. An apparatus according to Claim 1 wherein the means for performing analysis is means for calculating the concentration within the gas mixture of the individual gas component.

8. An apparatus according to Claim 1 wherein at  
10 least one chemo/electro-active material, when at a temperature of about 400°C or more, (i) has an electrical resistivity in the range of about 1 ohm-cm to about  $10^5$  ohm-cm, and (ii) exhibits a change in electrical resistance of at least about 0.1 percent  
15 upon exposure of the material to an individual gas component, as compared to the resistance before exposure.

9. An apparatus according to Claim 1 wherein the electrical response characteristic of each material  
20 upon exposure to the gas mixture at a selected temperature is quantifiable as a value, and the response value of at least one material is constant or varies by no more than about twenty percent during exposure of the material to an individual gas component  
25 at the selected temperature for a period of at least about one minute.

10. An apparatus according to Claim 1 wherein the electrical response is selected from the group consisting of resistance, impedance, capacitance,  
30 voltage or current.

11. An apparatus according to Claim 1 wherein at least one chemo/electro-active material is a metal oxide.

12. In a multi-component gas mixture having a  
35 temperature of about 400°C or more, an apparatus for calculating the concentration of at least two individual analyte gas components in the mixture, comprising:

- 5 (a) an array of at least three chemo/electro-active materials, the array being situated within the gas mixture, and each chemo/electro-active material having a different electrical response characteristic upon exposure to each of the individual analyte gas components than each of the other chemo/electro-active materials;
- 10 (b) means for determining an electrical response of each chemo/electro-active material upon exposure of the array to the unseparated components of the gas mixture; and
- 15 (c) means for calculating the concentration of each of the individual analyte gas components from the electrical responses of the chemo/electro-active materials upon exposure to the multi-component gas mixture only.
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13. An apparatus according to Claim 12 wherein the gas mixture is an emission from a combustion process.

- 25 14. An apparatus according to Claim 12 wherein the temperature of each chemo/electro-active material is determined substantially only by the variable temperature of the gas mixture.

- 30 15. An apparatus according to Claim 12 wherein at least one chemo/electro-active material, when at a temperature of about 400°C or more, (i) has an electrical resistivity in the range of about 1 ohm-cm to about  $10^5$  ohm-cm, and (ii) exhibits a change in electrical resistance of at least about 0.1 percent upon exposure of the material to an analyte gas component, as compared to the resistance before exposure
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16. An apparatus according to Claim 12 wherein the electrical response characteristic of each material upon exposure to the gas mixture at a selected